THE ROLE OF U.S. MILITARY BASES IN THE PHILIPPINE ECONOMY

Douglas F. Loveday

Rand

SANTA MONICA, CA 90406

PREFACE

The study reported here was completed in February 1970. It attempts to assess the contribution made to the Philippine national economy by the presence of U.S. military bases. It is part of a larger study made for the Office of the Assistant Secretary of Defense/International Security Affairs on the subject of various issues in the Pacific area.

The proportion of Philippine GNP for 1966 and 1967 found attributable to the spending associated with the presence of U.S. bases -- about 9.5 percent -- may seem quite substantial. It is important to take note of the qualifications set forth for interpreting this result in the first three sections. The importance of these qualifications has been demonstrated since this study was completed. Section III considers what the Philippine response to a major loss of foreign exchange earnings might be. In mid-1970 a major new piece of evidence on that question materialized: the Philippine peso was devalued. This apparent capacity for flexibility strengthens the expectation that the actual welfare loss attending a cessation of spending associated with U.S. bases would be substantially less than the 9.5 percent of Philippine GNP which might be attributed to that spending in 1966 and 1967.

The results of this study will be of interest to the International Security Affairs office of the Department of Defense and other Defense agencies operating in and dealing with the Government of the Philippines. They should be of interest as well to agencies of the U.S. State Department responsible for Philippine affairs and any other agencies concerned with financing, trade, and economic development activities jointly involving the United States and the Philippines.

SUMMARY

The principal beneficial impact of U.S. bases on the Philippine economy arises from dollar expenditures made by base agencies, personnel, and visitors on purchases from the local economy. In an economy with resources that would otherwise be unemployed, income derived from these sales would be entirely a net benefit. Indeed, merely counting the number of dollars spent is an inadequate measure of the total benefit, for this income is respent, stimulating still more employment, and the dollars used are added to the foreign exchange reserve for financing imports and supporting the dollar value of the peso, making possible still further increases of employment and income through internal credit expansion. The total benefit in this case is found by multiplying the base-generated dollar spending by $1/m$, where m is the economy's propensity to import. Various approaches to determining the value of m were explored. The preferred method was to choose a value suggested by the historical record of national income accounts through the least squares fitting of linear functions relating GNP and imports to exogenous expenditures. This was complicated by the existence of various versions of the historical record of Philippine national income accounts. The data set deemed most acceptable among Philippine officialdom yielded a value of $m = .24$. It is possible that other data and assumptions come closer to the truth.

U.S. base-generated dollar spending was about $135.8 million in 1966 and about $150 million in 1967. The estimated total benefit to the Philippine economy is $566 million, or 2,207 million pesos ($1 = 3.9 pesos), for 1966; and $625 million, or 2,438 million pesos, for 1967. These amounts are about 9.5 percent and 9.6 percent of the Philippine GNP for 1966 and 1967, respectively. These total impact measurements represent the potential amounts that the export earnings from U.S. bases could have contributed to Philippine GNP in 1966 and 1967 without weakening the peso any more than would have happened had there been no earnings from U.S. bases. Actually, these earnings may be interpreted to have strengthened the peso during those years. To the extent that their effects are viewed in this way, the portions of

GNP attributable to them are less than the potential amounts estimated. The loss of this source of dollar earnings, unless compensated for by gains elsewhere, might be expected to have a significant effect on the Philippine balance of payments and terms of trade.

The total impact measurements should not be viewed as projections of losses that would occur to the Philippine economy should U.S. base-generated spending cease. Resources employed by this spending probably include some scarce types despite the existence of unemployment for labor in the aggregate. Reallocations of these and other resources, together with other adaptive adjustments, might be expected at least to partially offset the effects of a cessation of base spending. In general, the estimates suggest maximum potential losses and the degree of adjustment that would be necessary to avoid them. This study has not attempted to make a definitive assessment of the capacity of the Philippine economy to make such adjustments.

Some of the results raise questions for further research. The values of multipliers derived in the regression analysis imply surprisingly high propensities to import, save, and pay taxes in the Philippine economy, in view of previous estimates of them. Also, the model implies that Philippine GNP is almost entirely dependent on export earnings. This may be explained as the result of a linear approximation of a nonlinear relation. Other alternatives, such as a dynamic relation or comparative advantages in specialization, could also be explored.

This study shows a larger beneficial impact of U.S. bases on the Philippine economy than is shown by a previous study done at the University of the Philippines, but a smaller one than is shown in a limited-distribution study done at Rand in November 1968.[*] Several serious questions are raised here regarding the validity of the study done at the University of the Philippines.

_____

[*]The estimated impact of U.S. bases on the Philippine economy is modified here by re-estimation of parameters using data deemed more likely to be credible in Philippine views. The GNP multiplier is found to be 1.544 instead of 2.007, as used in the earlier Rand study. The contribution of base spending plus recirculation is $209.7 million (838.8

In addition to the benefit from base-connected spending, other benefits accrue in the form of skill development and resource transfers through refuse disposal and pilferage. So far as these could be assessed, their values are relatively negligible.

---

million pesos) instead of $271.6 million, accounting for about 3.52 percent of total GNP and employment instead of 3.88 percent. This was about 385,000 jobs in 1966 instead of 426,000.

The import multiplier is found to be .3672 instead of .28. The net new supply of foreign exchange was $85.5 million instead of $97.8 million. The potential additional GNP contribution therefore would have been $356.2 million instead of $698.6 million. The total benefit then comes to 9.5 percent of 1966 Philippine GNP instead of the 13.86 percent found before.

ACKNOWLEDGMENTS

CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

This Memorandum attempts to find a quick and short answer to the question of the extent to which the Philippine economy depends on U.S. military bases there. In interpreting this question, the Philippine economy was taken to mean the full set of economic institutions, relative prices, income flows, activities, and trends roughly as they have existed in the Philippines in the recent past. The extent of dependence was interpreted to mean the amount and proportion of recent income and employment of Philippine citizens that can be attributed to the presence and operations of U.S. bases on Philippine territory, given the current structure of the economy.

The ways in which the economy might benefit from U.S. base presence were conceived to be income earned from sales of labor and other items to base agencies and personnel, increased skills acquired in the course of employment or job training, goods moving from bases into domestic economic activities through refuse disposal and pilferage, other foreign demands attracted to the Philippines by facilities provided to meet base demands, and redistribution of relative income among various groups in the economy and society. Because of limited resources these possibilities were not investigated exhaustively. Initial inquiries for the most part resulted in indications that benefits derived through these means were negligible or inordinately difficult to determine. The principal benefit measurable in some sense is the generation of income flows and foreign exchange earnings.

Purchases made from the Philippine economy by the U.S. Department of Defense for the operation of bases and by U.S. personnel stationed there constitute income earned by Philippine citizens from export sales to the U.S. economy. They also constitute foreign exchange -- an increased capacity to import -- acquired by the Philippine economy.

To estimate the benefit from this source requires (1) an estimate of the amount of purchases made by U.S. base agencies and personnel, and (2) a theory that relates this quantity to the benefit. The first part has been obtained by the U.S. Department of State for the calendar

years 1966 and 1967. The figures are given in Section V and are accepted without further question for the purpose of this study. The second part presents a major problem. Application of the logically most acceptable economic theory would require resources beyond those available.

If the question addressed were to be interpreted as calling for a prediction or a projection of the course of Philippine economic welfare following an actual or hypothesized closing down of U.S. military bases, it would have to be left unanswered with the resources devoted to this research. Instead the question has been interpreted as calling for an estimate of the amount and proportion of recent income and employment of Philippine citizens attributable to U.S. bases given the structure of prices, currency exchange rates, activities, and institutions that have actually existed.

This estimate might be regarded as an upper limit of what a prediction of welfare loss following base removal would be. If U.S. bases actually were removed, adaptive changes in Philippine economic structure and policies would almost surely occur, reducing the actual welfare loss to something less than this limit. The amount of this reduction would depend on how adaptable the Philippine economy would prove to be.

Section II presents an outline of a theory for explaining the basic relation between Philippine welfare and export earnings derived from U.S. bases. Section III discusses the prospects of and uncertainties about Philippine adaptability to a substantial loss of export income. Section IV discusses models for relating changes in Philippine income to changes in export earnings from U.S. bases. Section V presents estimates of U.S. base-generated dollar spending on the Philippine economy and its implications for Philippine GNP derived from the model described in Section IV and Appendix B. Section VI discusses questions for further research. Section VII deals with ways in which the Philippine economy might benefit from U.S. bases other than directly through export earnings. Section VIII is the conclusion and contains two tables summarizing the estimates

of economic impacts of U.S. bases on the Philippine economy. Appendix
A discusses a previous study of this topic and advances the criterion
used here for estimating the total impact of a marginal portion of
exports on the domestic economy. Appendix B presents the model used
for determining assumptions made about the relation between GNP and
exports.

II. U.S. MILITARY BASES AS AN INTERNATIONAL ECONOMIC EXCHANGE

One basic way of viewing the economic role of U.S. bases in a foreign country is as an international exchange of goods. The host country makes sales associated with the presence of a base. The dollar earnings from these sales to U.S. personnel and government agencies supplement the import capacity of the host national economy. The net advantage to the host country may be analyzed as is the gain from international trade generally.

THE GAIN FROM TRADE

As a simple illustrative analysis we might examine the case of a hypothetical economy producing two goods. Any combination of quantities of these two goods can be represented as a point in the positive quadrant of a two dimensional coordinate system. The set of all possible alternative combinations that can be produced by the hypothetical economy can be represented as a region in the positive quadrant, such as the shaded area in Fig. 1. If the economy operates in an optimum way, it will produce the one combination, among this set of possibilities, that has the greatest value for its members.

Given the optimal combination, say point P in Fig. 1, in a well organized free market economy, there is an associated price ratio between the two goods represented by the slope of the line tangent to the possibility set at P. This price ratio is uniquely determined as the only one consistent with the equilibrium of the economy at P. If either good were cheaper relative to the other, there would be an incentive for members of the economy to trade the relatively more expensive good for more of the cheaper good. This would tend to move the total product combination from P in a direction away from the possibility set. Since this is collectively impossible, market pressure would force the price ratio back to the value of the slope at P.

This optimal price and quantity solution is based on the absence of international trading opportunities. If a trading opportunity is introduced, still assuming the two-good world, the price ratio in
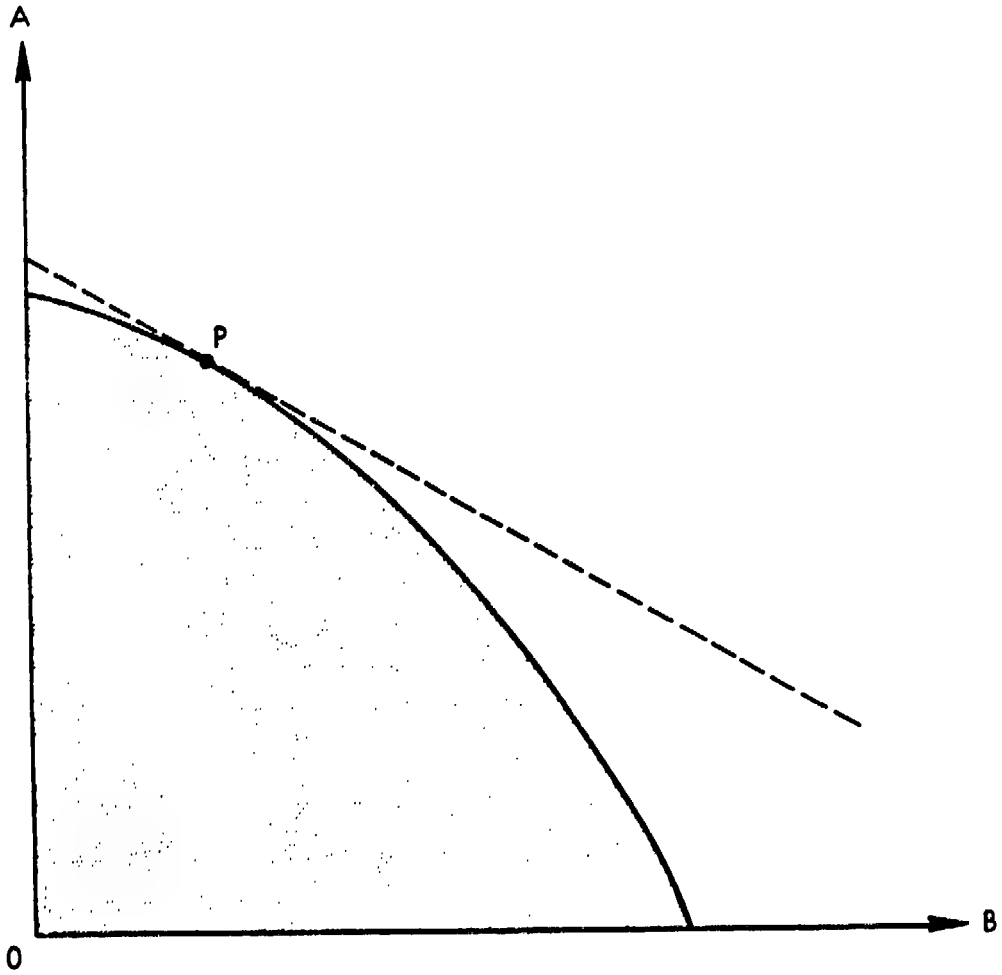
Fig.1—The possibility set of production
combinations of goods A and B

trade may differ from that determined in the isolated national economy.
If it does not differ, the production possibility set shown in Fig. 1
becomes a production and trade possibility set including the whole
area under the line through P. In this case, assuming diminishing
relative marginal utility of either good as the ratio of its quantity
to that of the other increases, P would remain the optimal combination.
There would be no incentive for the nation to take advantage of the
trading opportunity.

If the price ratio in trade does differ from that determined in
the isolated national economy, the production and trade possibility
set, given the original production combination, would appear as some-
thing like the shaded area in Fig. 2. One good is cheaper relative
to the other than in the isolated economy. The incentive for members
of the economy to trade in favor of the cheaper good is realized
through international trade. A combination, such as that represented
by point C, can be chosen that would be impossible in the isolated
economy.

Since P represents the best combination attainable in the isolated
economy and since C is preferred to P by the members of that economy,
the nation is better off because of its international trading oppor-
tunity. It can further exploit this opportunity by changing its pro-
duction combination in favor of more of good B, thus expanding its
production and trade possibility set. The optimal production combi-
nation in this situation is represented by point P'. The production
and trade possibility set is then represented by the entire area
under the line tangent to the production possibility area at point P'.
The nation is then in a position to choose a combination like C', which
includes greater quantities of both goods than does C or P. While
remaining consistent with all the assumptions of this analysis, it
may alternatively choose a combination, like C" or C'", that includes
less of one good or the other. Whatever its choice, the nation enjoys
a higher value combination than that represented by C. It improves
its position by adjusting its domestic production to exploit its inter-
national trading opportunity.
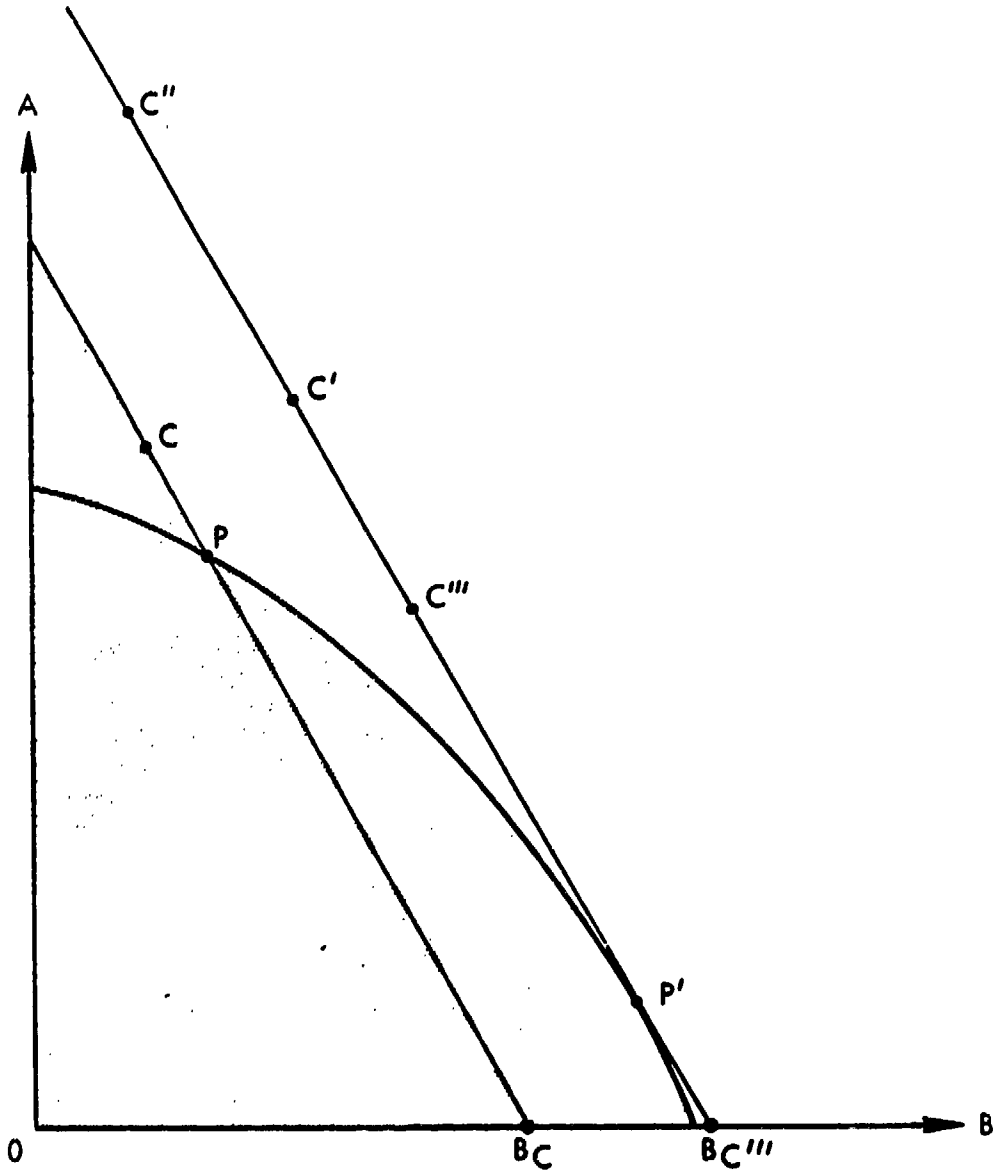
Fig.2—The production and trade possibility set

The gains from trade and production adjustment are not directly subject to any cardinal measure. In ordinal terms it can be said that C" is better than C is better than P is better than P'. But in no case can it be said by what amount or percentage one combination exceeds another. Two combinations might be compared indirectly in terms of one good, provided they are associated with the same price ratio or set of ratios. For example, C and C'" might be measured by the amounts of good B represented by the segments of the horizontal axis in Fig. 2 lying between the origin and the intersections with the price lines through points B_C and $B_C'"$ respectively. The basic invalidity of this measurement technique, however, can be seen by observing that points C and P' can be compared the same way. While the B equivalent of P' is greater than that of C, it has already been seen that P' is an inferior choice. The information content of national income figures is diminished by this basic measurement difficulty. Real incomes are vectors of quantities of many different goods. Money figures furnish only a rough index which is useful if it can be assumed that the combinations compared are not too far apart in the goods vector space and that the sets of price ratios associated with them are not too different.

This simple analysis has used the method of comparative statics. It has demonstrated the gain from trade by comparing optimal choices in different situations. In the analysis of practical questions about the effects of changes in a nation's trading situation it may be desirable to consider the process of adjustment itself and the costs that it may involve. Modern national economies may suffer from price rigidities, imperfect markets, prolonged unemployment, and loss of potential production. The shift from the optimal production combination in one situation to that in another as situations change is not necessarily automatic or immediate. It involves some resources becoming unemployed then re-employed. The period between may be short or long. The great American depression of the 1930s suggested that unemployment might persist almost indefinitely without deliberate corrective action.

If there is an unfavorable change in a nation's trading position, two kinds of losses may result. One will be called the situational loss, the loss of advantage from trade that cannot be avoided even with perfect adjustment to the situational change. It persists as long as the new situation lasts. The other kind of loss will be called an efficiency loss, that resulting from failure to adjust perfectly to the new situation. It is essentially due to the disorganization that results from "having the rug pulled out" from under an economy that has become adjusted to a particular situation. It is temporary in nature, although it may be prolonged and the losses once suffered are irrecoverable.

A LOSS OF TRADE

One way of expressing the total loss rate immediately consequent upon a loss of an export market (such as earnings associated with the presence of a U.S. military base) is by a simple Keynesian model relating GNP to export earnings, such as that developed in the Appendixes to this Memorandum. The model takes no direct account of price changes, currency exchange rates, price demand functions, or production functions. It is based on the assumption that unemployment may occur in an economy and that the actual production of goods may therefore be represented by an internal point of the production possibility set. The relation of this model to the previous analysis is illustrated by Fig. 3 and the following discussion.

Suppose the national economy is producing the combination P' and exporting a quantity of one good measured by the distance FP'. With the export earnings it imports a quantity of the other good measured by the distance FC'. Thus through trade it is acquiring the combination C' by producing the combination P', and this is represented by the triangle, P'FC'. This will be called the trade triangle (not to be confused with a certain geographic concept of multilateral trade).

Next suppose that a portion of the export market, say that represented by the distance EP', is removed, as might be the case with the removal of a U.S. military base. With this cut in export earnings the
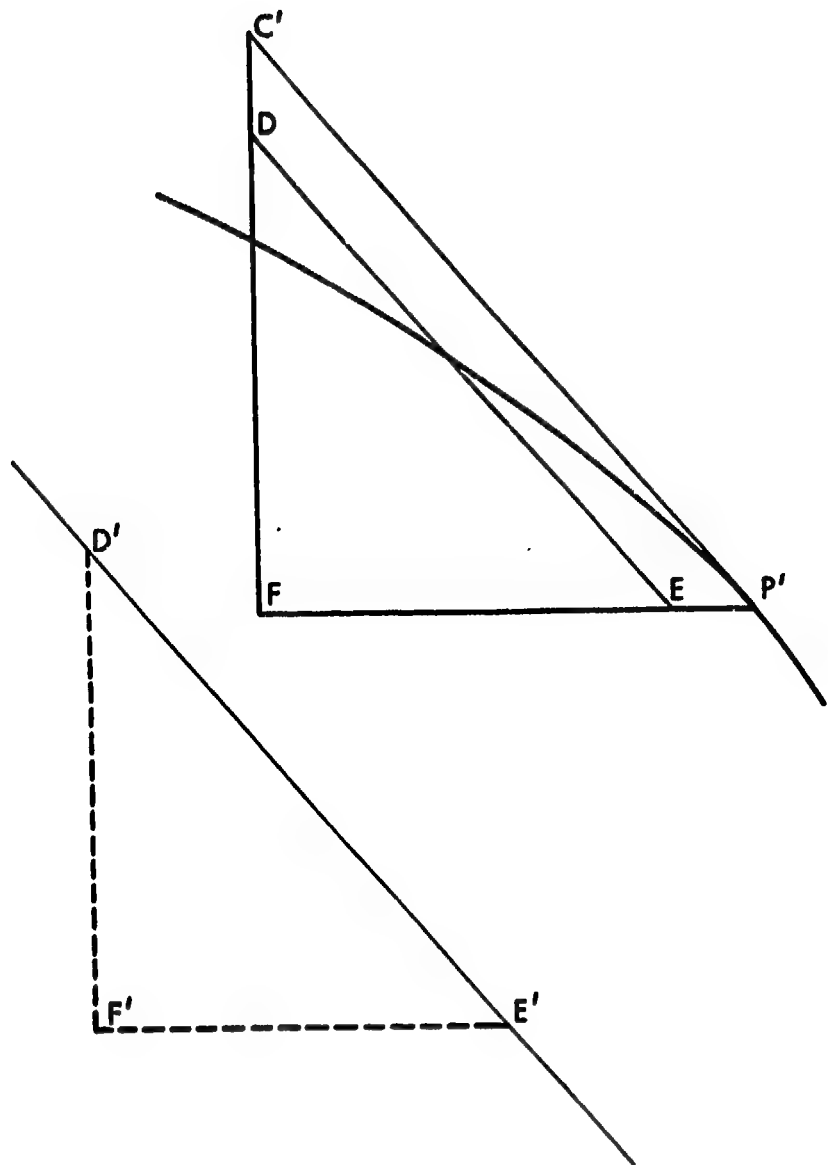
Fig.3—Response of the trade triangle to loss
of export market

ability to import is cut by an amount represented by the distance DC'.
Given constant price and currency exchange ratios, however, the demand
for imports will not necessarily shrink by the same amount. The
Keynesian model assumes that imports are a linear function of GNP.
The level of GNP is represented in the first instance here by the line
through P'C'. The loss of export earnings EP' reduces it to the level
represented by the line through DE. This loss of employment and income
results in some reduction in demand for imports but not by an amount
as great as DC'. There remains a disequilibrium between the demand
for imports and the reduced supply of foreign exchange from export
earnings.

Given that the national economic authorities seek to maintain the
original currency exchange ratio and avoid the use of exchange controls
in favor of a policy of maintaining the balance of payments through
fiscal and monetary controls on credit and spending, the GNP must be
further reduced by an amount great enough to reduce the demand for
imports to the amount FD. In general the required overall reduction
in the GNP from the level at P'C' is some multiple of the amount DC',
depending on the relational parameter best confirmed by the data with
which the Keynesian model is tested. The new equilibrium level of
GNP is represented in Fig. 3 by the line through D'E'.

The trade triangle D'E'F' is the same size as DEF, shrunken from
the original P'FC' by the loss of export EP'. The new production
combination E' indicates unemployment and loss of income much greater
than that occasioned by the original loss of export income and indi-
cated by the production combination E. This response to the loss of
an export opportunity is far from optimal. It reflects an efficiency
loss as well as the situational loss.

It may be presumed that ultimately a production combination on
the possibilities frontier (envelope curve) would again be attained.
This would be accompanied by changes in the shape and size as well as
the location of the trade triangle. To estimate empirically what the
ultimate production and trade pattern would be might be impossible
and at the least would require a great amount of research on production

and demand functions. Any estimate of actual amount or percentage loss
of values would be difficult and hazardous. As mentioned previously,
there is no cardinal measure of the gains from trade. (The monetary
measure of the loss in moving from C' to D' in Fig. 3 which is derived
from the Keynesian model is not difficult. It may also be less dan-
gerous insofar as the assumption of constant price ratios is acceptable.
However, the danger of making this assumption may be greater.)

The GNP level represented by line D'E' is an estimate based on
certain limiting assumptions about the mode of response of the national
economic authorities. More probably the response of Philippine policy-
makers to a removal of U.S. bases would differ in some degree from
these assumptions. Nevertheless, immediate full adjustment would be
unlikely. To re-employ the labor and other resources released by
the reduction of exports in import substitute industries might require
an extensive reorganization of resources throughout the economy. This
is not simply a technical task. Incentives must be changed. A re-
distribution of income is implied. While some may gain, the prevail-
ing form of income changes would be losses since it is a general loss
to the economy that would be distributed. Widespread dissatisfaction
and resistance to the changes necessary for readjustment of the economy
might be expected. There would be a temptation for politicians to
leave the burden of the loss on those who directly suffer it and to
rely on relief doles and invective against the United States instead
of taking corrective action. The difficult and inferior solution of
adjusting the economy to the loss of export earnings would probably
prompt special diplomatic and commercial efforts to make up the loss
with new sources of export earnings and foreign aid. If these efforts
should be unsuccessful, and as the loss would spread and deepen through
the multiplier effect, or monetary chaos increase if policymakers
ignore the balance of payments problem, the resistance to corrective
action would gradually be overcome.

The economic loss over time resulting from the loss of a portion
of a nation's export opportunities, as in the case of the removal of
a U.S. military base, may be represented in graphic form, depending

on the assumption made about the manner and timing of removal and of the response of economic policymakers. Fig. 4 illustrates the case of a sudden removal without preplanned economic coordination, such as might occur in a capitulation under pressure of strident nationalistic demands, in which the economic policymakers follow a policy of maintaining the balance of payments and currency exchange rate by controlling credit and spending.

The value of the export earnings loss is represented by the vertical distance included in the bracket. The situational loss is represented by the vertical distance between the two dashed lines; the remainder of the overall loss is efficiency loss. The overall loss rate implied by the Keynesian model is represented by the vertical distance from the top dashed line to the low point of the trough. If no corrective action ever occurred, the solid line would continue horizontally to the right from this low point. Even at worst, however, it is presumed that adjustment and recovery would eventually proceed. Economic welfare would then gradually rise to the level attainable by choosing the optimal production and trade combination available in the new situation.

The overall loss rate implied by the Keynesian model has been used here as a measure of the extent to which the Philippine economy is currently dependent on U.S. military bases there. Adaptive policy changes, either preplanned, concurrent, or subsequent to base removal, could reduce this dependency to a degree as low as that implied by the situational loss alone. Even this degree of dependency exists only insofar as substitute sources of foreign exchange cannot be easily found.

Given different assumptions about the timing and manner of base removal and local response, the solid line in the period following a removal of U.S. bases could assume any of numerous positions between that shown in Fig. 4 and a most favorable case in which welfare would not fall below the lower of the two dashed lines. This would assume a gradual phasing out of base operations with preplanned, timely, and well-executed adjustments of domestic economic policies. A further
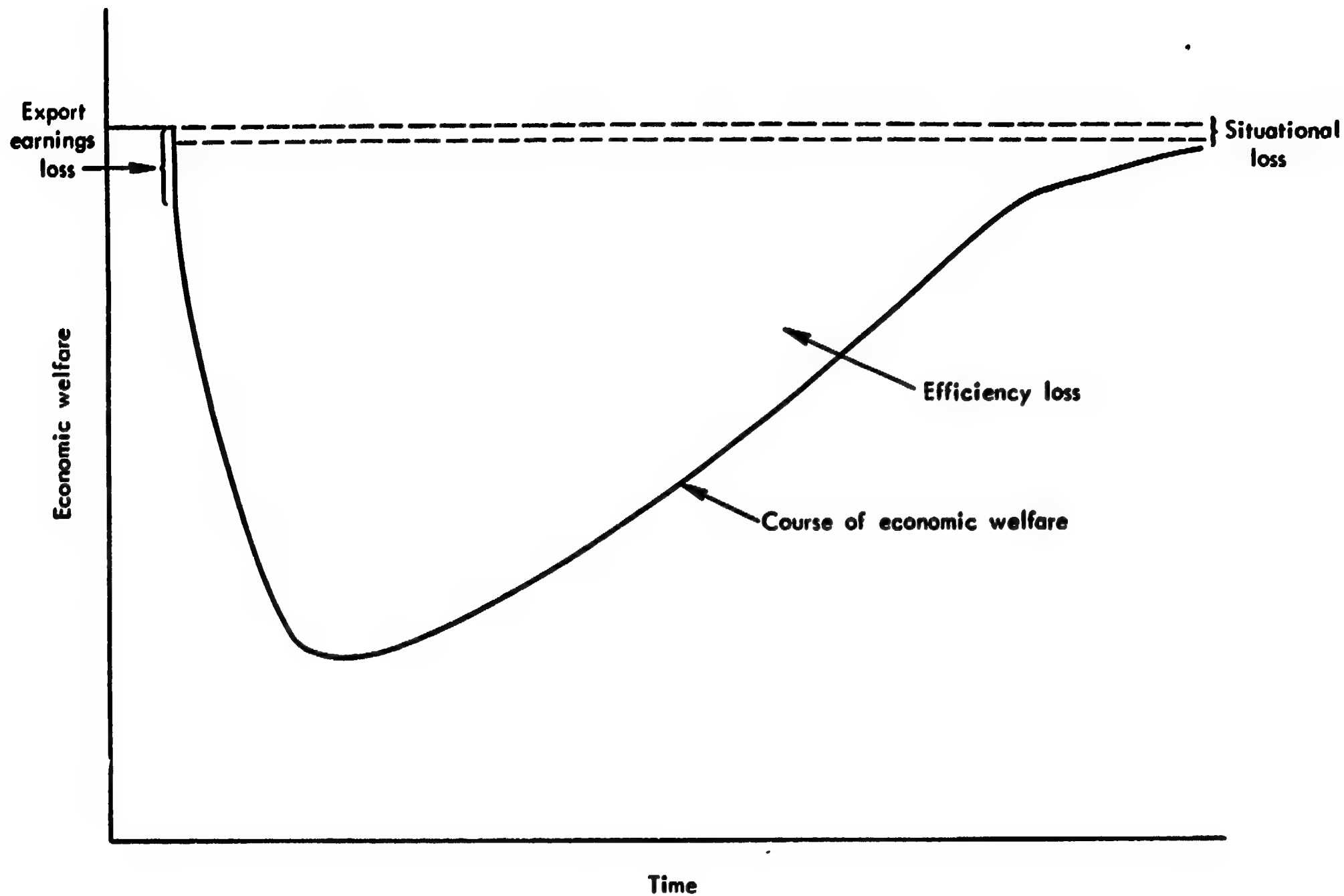
Fig. 4—Hypothetical course of economic welfare over time following
a loss of export opportunity

set of possibilities would be generated by assuming that the whole
situation is combined with a condition of economic growth so that the
two dashed lines would indicate an upward trend over time, and the
solid line would be adjusted to remain asymptotic to the lower dashed
line.

III. PHILIPPINE CAPACITY TO ADJUST TO LOSSES OF TRADE

This Memorandum does not attempt to predict what the actual out-
come of the removal of U.S. bases would be for Philippine economic
welfare, but to estimate the magnitude of one factor in that outcome --
the current dependence of the Philippine economy on U.S. base presence
and the consequent potential loss that might be suffered from their
removal in the absence of adaptive adjustments. The other general
factor, not explored here, is the capacity of the economy to make
adjustments.

The history of Philippine experience since World War II suggests
what the response to a major loss of foreign exchange earnings might
be. Faced with a serious drain in international reserves in the late
1940s, and determined to maintain the exchange rate of approximately
two pesos per U.S. dollar which had prevailed before the war since
1903, the Philippine government imposed stringent exchange and import
controls in 1949.

The following decade witnessed a growing dissatisfaction with the
graft, favoritism, political repression, corruption, and inefficiency
that seemed to be associated with the administration of exchange con-
trols.[1] Nevertheless, the response in 1957 to another serious balance
of payments crisis brought on by a sharp rise in imports due to internal
monetary expansion was a tightening of exchange controls along with a
tightening of monetary conditions by the central bank. This occasioned
renewed debate on decontrol and devaluation as an alternative.

The principal obstacle to decontrol was the fear that devaluation
would result in inflation and that foreign demand for Philippine exports
was inelastic, so that foreign exchange earnings would be reduced in-
stead of increased. In 1959 these fears were overcome enough to start
a program of gradual decontrol and devaluation. A relaxation of credit
and fiscal controls in 1960 resulted in further inflationary pressures
and balance of payments problems in late 1960 and throughout 1961. The

---

[1] Robert F. Emery, "The Successful Philippine Decontrol and Devalua-
tion," Asian Survey, Vol. III, No. 6, June 1963, pp. 276-277.

Garcia administration was apparently paralyzed by fears of moving either back to tighter exchange controls or on to devaluation. It is said that the loss of exchange reserves in 1961 may have contributed to Garcia's election defeat in November of that year.[1] The new administration moved rapidly on to decontrol and a "freely fluctuating" exchange rate.

Fear that this move might threaten reserves prompted the Philippine central bank to obtain a package of stabilization credits from U.S. agencies and banks and the International Monetary Fund, announced to total $300,000,000. In acquiring the credits, the Philippine bank gave assurances that it intended to let the exchange rate fluctuate freely. This intention should have obviated the need for credits, but the Philippine bank hoped that the announcement would help discourage speculation against the peso.

In spite of assurances, the central bank did sell foreign exchange from its reserves after the date of decontrol, January 22, 1962, under heavy forward contract obligations assumed prior to decontrol. With this heavy support the exchange rate went from 4.50 pesos per dollar immediately after decontrol to 3.46 per dollar by February 7. To adhere strictly to its assurances of non-intervention, the central bank should have met these forward contract obligations by obtaining exchange in the free market. When it began to do this about late March or early April the exchange rate went to about 3.90 pesos per dollar where it has tended to remain.[2] In addition to direct market intervention after decontrol, the central bank attempted to protect the peso by tightening credit, doubling the discount rate from 3 to 6

---

[1] _Ibid._, p. 279.

[2] International Monetary Fund, _International Financial Statistics_, Vol. XXII, No. 2, February 1969, pp. 256-257. During the gradual decontrol program, there was a split rate. Exporters received fewer pesos per dollar earned than importers paid for the dollars. With decontrol this was continued by requiring exporters to sell 20 percent of their dollar earnings to the central bank at the official par rate of 2.00 pesos per dollar. This requirement was ended in November 1965, when an agreement was made with the IMF to set the par value of the Philippine peso at 3.90 pesos per U.S. dollar.

percent, and raising commercial bank reserve requirements from 15 to 19 percent.

In general, Philippine experience with decontrol has been favorable, certainly not disastrous as was widely feared prior to the bold move. This suggests that Philippine policymakers may be less inhibited in the future about letting the peso depreciate in response to adverse changes in the international trading situation. On the other hand there might be some question as to how much of the old fear of devaluation still lingers. Also there might be some question as to what the elasticity of foreign demand is currently. The past success may have been a stroke of luck. More knowledge about current conditions might be needed to give confidence that it can be repeated.

The course of economic welfare following a major loss of export income would depend partly on policies chosen to cope with it. The basic alternatives are exchange controls (and other forms of rationing capacity to import, such as import licensing, quotas, and tariffs), currency devaluation, and restriction of money and credit. Monetary restriction reduces demand for imports by reducing GNP and aggregate demand generally. Any one, or some combination, of these policies may be chosen. Theoretically, the best choice for the smallest welfare loss rate in the long run is devaluation. This would be part of a laissez-faire approach, letting all prices, including the exchange rate, move in response to changing supply and demand conditions. In this way incentives are adjusted to encourage all members of society to optimally adjust their economic activities.

The fact that people frequently do not quickly adjust their activities in their own best rational interests, however, can mean that the actual outcome falls far short of the theoretical outcome of a laissez-faire policy. Appeals for political action to protect established economic positions are frequently substituted for efforts to adjust or change positions in response to changed situations. In attempting to cope with the economic consequences of a removal of U.S. bases, the Philippine government may be hampered by such demands from internal sources as well as restraints from external sources such as other

countries with competing exports and agreements with international
agencies like the IMF. Also, while laissez-faire is theoretically
the best policy from a world welfare point of view, it may not be so
from a particular national point of view.

History suggests that the Philippines are probably relatively
flexible in facing the prospect of currency devaluation. However, the
exchange rate since the 1962 decontrol has been fairly stable.[*] The
expectations and activities built up over a seven year period of sta-
bility may be painful to change. While the government may resort to
exchange controls less than in the past, monetary restriction is not
necessarily less likely than in the past. It may be used even more
than in the past, as a partial substitute for exchange control. It
has been used vigorously both to supplement exchange control and to
cushion the effects of decontrol. Monetary restriction is, however,
a poor candidate for exclusive use in restricting imports to balance
international payments. This would probably be even more unpopular
than either devaluation or exchange control. (Any choice at all of
a policy mix to cope with the loss of export earnings resulting from
U.S. base removal would be a difficult one since the problem would be
essentially to make the best of a bad situation. The Philippine people
might take solace in the fact that they no longer suffer the presence
of U.S. bases. Indeed, they may feel the advantage of this outweighs
the export earnings loss to which they must make an unpleasant adjust-
ment. Presumably these values would have been weighed against each
other in the political process if the base removal was the result of
a domestic political decision.)

The model used in this Memorandum to estimate the current depen-
dence of the Philippine economy on U.S. bases rests on an equivalent
to the assumption that Philippine policymakers would use monetary
restriction exclusively for offsetting the balance of payments effect
of U.S. base removal. The results should not be interpreted as a
prediction or a projected consequence of base removal; they show a

---

[*]Until the recent devaluation referred to in the Preface. Unoffi-
cial rates, of course, previously deviated from the old official rate.

loss potential that would be realized only in an unlikely worst possible case. They could be used as an input for further research aimed at deriving a projection by determining what proportion of this loss potential could be avoided by Philippine policymakers by substituting policies other than monetary restriction for coping with the adverse balance of payments effect.

IV.   ESTIMATING TRADE DEPENDENCE

THE PHILIPPINE MODEL

A model for relating GNP to exports has been used in a study done
at the University of the Philippines.[1]   That study estimated the amount
of Philippine GNP for 1966 that could be attributed to U.S. base-
generated dollar spending in the same year. The estimated amount was
conceived to be a multiple of the dollars spent. The multiplier
depended partly on the distribution of the dollar spending among
various categories used in estimating base spending in a U.S. State
Department inquiry. Thus the data input required by this model to
yield an estimate of the amount of GNP associated with base spending
includes the distribution as well as the amount of spending.

The form of the multiplier also involved the marginal propensi-
ties of the Philippine economy to save, tax, and import. These
quantities were provided by a combination of expert judgment and the
results of previous studies. Thus this model completely specified
form and parameter values. The GNP multiplier of base expenditures
for 1966 was found to be 2. A general critique of the model is pre-
sented as Appendix A of this Memorandum.

A LINEAR FORM MODEL

The model relied on for the results given in this Memorandum is
presented in Appendix B. It is specified in form but not in parameter
values, which are estimated by fitting the form to recent annual
Philippine national accounts data. It is suggested by arguments in
the tradition attributed to Keynes that the GNP depends on certain
expenditures regarded as exogenous to any economic system. These
arguments imply a monotonic, though not necessarily linear, form. The
linear form is adopted for convenience in specifying a process that
gives rise to the national accounts data. If credence is given to

---

[1] Economic Research Associates, "Economic Effects of U.S. Govern-
ment Expenditures on the Philippine Economy," August 1967.

both the process specified and the data found, then the parameter
values can be inferred by the oridnary least squares regression tech-
nique.

The process described in Appendix B is given as a reasonable
approximation of a Keynesian causal model. Conclusions based on the
linear form about a difference in variable values should approximate
those based on a nonlinear form, providing the difference is not too
large a proportion of the total value. (The stringency of this limit-
ation depends on the particular nonlinear form to which the reader
might prefer to give credence.)

The problem of what, if any, data to believe is made explicit by
the presentation of three different versions of the Philippine national
accounts. Depending on which of these data sets the reader prefers to
believe, he may find acceptable some estimate of the GNP and import
multipliers derived in Appendix B and shown here:

Data Set	GNP Multiplier	Import Multiplier	Propensity to Import
I	1.544	.3672	.2378
II	2.007	.2812	.1401
III	1.372	.3998	.2914

Data set I is the most recently revised official set of figures. Later
arguments about the portion of Philippine GNP attributable to U.S. bases
will utilize these estimates.

The import multiplier is the product of the GNP multiplier and the
(marginal) propensity to import. It is estimated directly in the re-
gression analysis. The import propensity is estimated indirectly as
its ratio to the GNP multiplier. The Philippine study estimates the
impact of base spending on the GNP by the GNP multiplier. Some addi-
tion is also made to foreign exchange reserves net of that absorbed by
increased import demands also stimulated by the base spending. It is
argued in Appendix A that the total potential impact of base spending,
as of any marginal portion of export earnings, is measured by the re-
ciprocal of the marginal propensity to import. This is because, in

addition to income generated through respending of earnings from the
bases, further income expansion potential can be realized through
credit expansion based on the net addition to foreign exchange re-
serves. The net marginal supply of foreign exchange relaxes the
balance of payments constraint so that demands for imports arising
from the income expansion can be satisfied without depreciating the
domestic currency.

Thus if the marginal propensity to import is .24, the potential
total impact on GNP of the marginal $1 of export earnings is $4.17.
The measure of loss indicated by the vertical distance from the top
dashed line to the bottom of the trough in Fig. 4 associated with a
precipitous loss of earnings from U.S. bases would be the amount of
earnings lost multiplied by 25/6.

The analysis of the impact on Philippine GNP of U.S. base spending
presented in the next section rests on the use of this model. It is
not advanced as the best possible model. One constructed as suggested
in Section II would be far superior but much more difficult to specify
reasonably with regard for empirical data. The limited validity of
the model used has conditioned the limited nature of the question
attacked in this Memorandum, as outlined in Section I.

Further, the regression model involves assumptions about Philip-
pine national accounts data that may be far from the truth. Specific
possible biases have not been analyzed, although much of the discussion
and information in this Memorandum and its appendixes are aimed at under-
standing the variance of reasonable possibilities. Most of the dis-
cussion concentrates on a limited set of conclusions believed most
reasonable or likely.

V. BASE SPENDING AND PHILIPPINE INCOME

Table 1 shows Philippine export earnings from U.S. bases in 1966. These data, omitting R&R spending, were utilized in the Philippine study, which generously rounded the total to $140 million; then, assuming the average annual income of an employed person to be 2,000 pesos and having concluded that the GNP multiplier in 1966 was 2, found the following total effects, given that one dollar equals 3.9 pesos: "1,092 million pesos of national income, 546 thousand employed persons, and 78.4 million dollars in foreign exchange. Relative to the size of the Philippine economy, the income and employment effects are not inconsiderable; they account for about 5 percent of the national totals." Although no national income or employment figures for 1966 were explicitly cited, the Philippine study must have estimated that the 1966 Philippine GNP was about 21.84 billion pesos and that there was an average of 10.92 million employed persons. This approximation of the 1966 Philippine GNP is a bit under the indications of other data sources. Tables B-1 and B-2 show 23.24 and 27.29 billion pesos respectively. The February 1969 issue of International Financi 1 Statistics shows 22.86 billion pesos.

Eleven million employed persons is just about one-third of the Philippine population.[1] It is reasonable to assume that 35 percent of the population is in the labor force. These data indicate a 1966 Philippine per capita GNP of about 651, 686, 697, or 819 pesos ($167, $176, $179, or $210), depending on the GNP figure given credence, and unemployment of about 6 to 8 percent of the labor force.[2]

---

[1] Agency for International Development, Selected Economic Data for the Less Developed Countries, June 1967, p. 4, shows Philippine population in 1966 at 33.5 million. It also shows 1965 GNP at $5.2 billion, or about 20.3 billion pesos.

[2] The Far Eastern Economic Review, 1968 Yearbook, p. 280, cites unemployment at 7 to 8 percent of the total labor force. On p. 281 the 1966 GNP is said to be 22.3 billion pesos and national income 18.6 billion pesos. However, U.S. News and World Report, November 13, 1967, p. 112, cites per capita income at $100 and "chronic" unemployment of "at least 12 percent."

Table 1

U.S. BASE-GENERATED PURCHASES FROM THE PHILIPPINE ECONOMY, 1966

		U.S. NAVY		U.S.A.F.		Totals 1966
I.	Local purchases					
	A. Appropriated Funds	9,033,900		12,027,922		
	B. Non-appropriated Funds	2,230,800		1,866,551		
	C. Exchanges	876,000		3,632,331		
			12,140,700		17,526,804	29,667,504
II.	Construction		11,941,000		3,938,811	15,879,811
III.	Wages-Filipinos					
	A. Appropriated Funds	12,419,200		4,700,000		
	B. Non-appropriated Funds	3,191,800		3,050,095		
			15,611,000		7,750,095	23,361,095
IV.	Private spending by U.S. Citizens					
	A. Housing	520,000		2,250,000		
	B. Domestics	831,385		3,116,692		
	C. Utilities	125,000		540,000		
			1,476,385		5,906,692	7,383,077
V.	Private spending other than IV.		20,555,615		15,429,846	35,985,461
VI.	Transients' spending		20,000,000		3,564,000	23,564,000
	Totals		81,724,700		54,116,248	135,840,948
	R&R Program spending					1,866,902
	Total including R&R					137,707,850

Source:
    Department of State, unpublished data.

-25-

The impression of serious unemployment seems common from most information sources.[1] It was a basic assumption in the Philippine study, which supported the conclusion that the portion of the GNP attributable to U.S. base-generated purchases could be regarded as substantially a measure of their contribution to Philippine welfare and employment, with no necessity of discounting for inflationary or resource transfer effects. Such a conclusion is neither maintained nor denied here. It seems highly probable that resources employed by U.S. base-generated spending are heterogeneous, including some scarce types despite any unemployment problem for labor in the aggregate. The effects of the cessation of such spending on welfare and employment would probably be partially offset by reallocations of such resources. Also, such an eventuality would probably be accompanied by U.S. abandonment of Philippine bases, which would leave land and facilities available for alternative enterprises that could provide job opportunities for a substantial proportion of the number of workers now depending, directly and indirectly, on the U.S. military presence for employment. The cessation of U.S. base operations, however, might result in some ultimate net loss of employment. But the main problem for the Philippine economy would be the loss of dollar income and the cost of planning and developing new enterprises.

The estimate of the contribution to Philippine GNP generated by U.S. bases derived from the assumptions represented in line XII of Table A-1, where m = .24, suggests that U.S. base-generated purchases in themselves gave rise to a $1.544 · 135.8 million = $209.7 million, or 817.7 million pesos contribution to the 1966 GNP. This is about 3.5176 percent of the 23,246 million peso GNP for 1966 from Table B-1. This GNP contribution generated demands for imports amounting to .24 · 817.7 million = 196,255,987 pesos, requiring $50,322,048 out of Philippine foreign exchange resources leaving a net new supply of

---

[1]But see H. Averch, F. Denton, and J. Koehler, A Crisis of Ambiguity: Political and Economic Development in the Philippines, R-473-AID, The Rand Corporation, January 1970. Their view of the Philippine economy suggests that the significance of unemployment is commonly misinterpreted.

foreign exchange earned from U.S. bases in the amount of $(135.8 -
50.32) million = $85,477,952. The total foreign exchange earned from
U.S. bases was 11.55 percent and the net new supply 7.27 percent, of
total Philippine exports in 1966.[1] This net new supply of foreign
exchange relaxes the balance of payments constraint on credit expansion
to the extent of about 85.4 ÷ .37 = 231 million dollars, or about 900
million pesos, which could account for an additional 1389 million pesos
of the 1966 Philippine GNP. This would amount to a total contribution
of about 2,207 million pesos to the Philippine economy attributable to
U.S. base-generated spending. This figure is the same as that derived
by applying the "total impact" multiplier, 1/m, and the peso-dollar
exchange rate, 3.9, directly to base spending: 135.8 · 3.9/.24 = 2207.
This is about 9.5 percent of the total GNP. The total impact, it should
be remembered, is not necessarily fully reflected in the GNP.

The 2207 million pesos is the potential amount that the export
earnings from U.S. bases could have contributed to Philippine GNP in
1966 without weakening the peso any more than would have happened had
there been no earnings from U.S. bases. Actually, these earnings may
be interpreted to have strengthened the peso in 1966. To the extent
that their effects are viewed in this way, the portion of GNP attri-
butable to them is less than 2207 million pesos.[2]

It can be inferred that about 3.5 percent of the employed labor
force, about 385,000 persons, are employed directly or indirectly by
job opportunities associated with U.S. bases. In addition, another

---

[1] Central Bank of the Philippines, Statistical Bulletin, Vol. XIX,
No. 2 (June 1967), p. 155, shows total foreign exchange receipts for
1966 as $1,810.51 million. Of this amount the earnings from U.S. bases
was 7.5 percent and net new supply 4.7 percent. The Office of Statis-
tical Coordination and Standards of the Philippine National Economic
Council, source of the data in Table B-1, p. 55, however, show 1966
Philippine export earnings at 4,584 million pesos, or about $1175.4
million.

[2] These remarks abstract from the problem of maintaining a reserve-
to-trade ratio. The rise in volume of foreign trade in general asso-
ciated with increased export earnings and GNP may require an increase
in foreign exchange reserves, deducted from the net new supply as cal-
culated above, simply to maintain the strength of the peso. Taking
account of this might reduce somewhat the "total impact" multiplier.

660,000, about 6 percent of the employed labor force, might owe their jobs to credit and GNP expansion made possible by the net new supply of foreign exchange acquired by the Philippine economy from U.S. base spending. Since each employed person, on the average, supports himself and two others, U.S. base spending might account for the support of over 3 million Filipinos. About 1.15 million are supported by base spending alone, exclusive of credit and GNP expansion which might depend on the net foreign exchange acquired. These amounts of income and employment, of course, are neither distributed equally over the Philippine population nor concentrated entirely on the numbers of people just mentioned. The effects of a cessation in base spending would be felt in different degrees and ways by different people. The numbers given above provide a rough indication of how widespread the effects might be. Probably several times those numbers would be affected in some degree. Yet only a small fraction would be faced with immediate near total losses of income. Given an average 1960-1966 GNP growth rate of 4.8 percent,[1] it may be said the economy would be set back about nine months, and failure to make up the foreign exchange loss might set it back nearly two years. Political repercussions could compound the problem.

Philippine export earnings from U.S. bases in 1967 were about $150 million.[2] Applying the assumptions used in assessing the significance of the 1966 spending, U.S. base spending in 1967 contributed about 321.6 million, or 903 million pesos, to the Philippine GNP. The measure of the total impact would be about 2438 million pesos. This suggests that 3.55 percent of the 1967 GNP is attributable to base spending, and the total impact is equivalent to 9.59 percent of the GNP.

Other numbers can be arrived at by a similar process using different sets of assumptions. For example, the assumptions represented in line VII of Table A-1 with m = .14, the same model fitted to a different

---

[1] Agency for International Development, Office of Program Coordination, Statistics and Reports Division, Gross National Product Growth Rates and Trend Data, March 21, 1967, Table 13, p. 4.

[2] This figure was obtained from unpublished material from the Department of State.

data set (Table B-2), imply that base spending generated about $271.6 million, or 1,059 million pesos of the 1966 Philippine GNP. That is about 3.88 percent of the 27.3 billion peso GNP, according to the same data set to which the assumptions are fitted. These assumptions also imply that the total impact was equivalent to about 13.86 percent of the GNP.

VI. SOME FURTHER RESEARCH POSSIBILITIES

The collection of historical base-spending data would serve to (1) provide estimates of the base-connected spending contribution to Philippine national income before 1966 and (2) test the hypothesis that the import content of spending in categories V and VI of Table 1 is greater than the national average. For the latter purpose data should be acquired from 1950 through 1967. Even then the magnitude and variability of the values may be insufficient for an adequate test. For these purposes, the collection of such past data does not justify any substantial cost.

Estimates of future spending must depend on highly speculative assumptions about future political and military events. Still, some research on spending factors might add to our capability to make short-run conditional projections. In particular, some sample surveys of the spending and saving habits of various classes of American personnel living, in transit, or on liberty on and near U.S. bases might yield a capability of improved estimates of spending in categories IV - VI shown in Table 1 and defined in Appendix A.

Some results of the analysis reported in this Memorandum suggest further questions. The regression results $M = 2$ and $m = .14$ using the data set in Table B-2, imply $s + t - st = .36$, which implies either s or t or both have much higher values than were assumed in the Philippine study (see Appendix A). The results with the other data sets imply a much higher value of m as well. The question is raised whether these implications can be reconciled with other evidence on the values of m, s, and t.

That the total benefit estimates of base spending bear nearly as high a ratio to total GNP as the base spending itself bears to export earnings implies that the Philippine GNP is almost entirely dependent on foreign trade. Implicit in the "total benefit" model, assuming credit is automatically expanded or contracted to maintain a given dollar value of the peso, is the relation:

$$GNP = \alpha + (1/m) \ (exports)$$

The numerical results seem to place a strangely low value on α.

This might be explained by finding that the above linear relation applies only to small changes in the value of exports and that the true total relation is one of rising marginal dependence. An additional detail that might be explored is the relation of foreign exchange reserve requirements for maintaining peso liquidity at various levels of foreign trade to estimates of the kind attempted here. This, however, could be a knotty problem, the solution of which would add only a small embellishment to the general analysis presented in this Memorandum.

The general confession that the data are of questionable reliability and that the model used is rudimentary may, of course, embrace the above difficulties or questions. Further research may produce data and/or models with more plausible results.

Finally, there remains the question of what the prospects are for continued U.S. possession of its Philippine bases. The answer to this would require at once a broader and a more disaggregate approach, taking into account social and political as well as economic factors and variations among regional and class groupings within the economy, society, and body politic as well as aggregate impacts like those analyzed here. The required research resources would be far greater than those devoted to this study.

A few suggestive items have been encountered in the course of this study. The city of Cavite has invested in full-page newspaper advertising to protect its economic interest in the American presence on Langley Point by publicly urging the national government to stop its agitation for the return of that minor U.S. base.[1] A similar but

---

[1]This information was acquired in the course of a trip to the Philippines by J. H. Hayes and other Rand researchers in April 1968.

The economic advantages are not entirely lost on leaders of other countries where there are potential sites for U.S. bases. The Asia Letter, No. 189, February 6, 1968, reported that Ceylon had added its name to the list of possible sites for a new United States naval base as it was interested in the jobs and development such a base would bring.

more complex situation is the relationship between Clark Air Base and Angeles City. Here it seems prosperity has probably enriched the insurgent HUK organization but may also have enticed it at least partly away from a political to an economic orientation. It is not obvious what the net effect is on pressures and problems faced by the national government in this area or how it is viewed by national politicians.

Part of the politico-economic research approach would be to identify resources whose values and incomes are affected by U.S. bases, identify the owners of these resources, and determine their roles in political decisionmaking processes. But a valid assessment of the prospects would require, in addition to this and to the effects of social political attitudes, consideration of similar politico-economic relationships with respect to many activities besides the bases.

In addition to the export earnings from the bases themselves, there are many other sources of economic leverage available to U.S. policymakers. In general, further research into the broader question of U.S. prospects in the Philippines could involve many parts and many intangible links.

VII. CONTRIBUTIONS BEYOND CURRENT EXPORT EARNINGS

In addition to the international trade opportunities afforded by the presence of U.S. bases, other factors, such as the development of useful skills, utilization of items acquired from the base through disposal or even pilferage, special industrial opportunities and income distribution effects, might also be considered. Efforts to acquire information on these items ended mostly in negative or inconclusive results as follows.

HUMAN CAPITAL

In addition to wages earned, workers on bases may acquire skills through work experiences that increase their potential future incomes and add to the resources of the national economy. In the course of any given year there is a theoretical sum of net changes in imputed capital values of Filipinos employed on the bases. These changes are unrecorded and difficult to determine but are partially reflected in promotions and transfers to higher paying jobs. A promotion may reflect skills acquired in previous years on the base, or already possessed prior to base employment but not utilized in the initial job assignment, or acquired through independent efforts off bases in after work hours. On the other hand, skill acquisition during a given year does not necessarily result in a promotion in the same year. In spite of these sources of possible error by overcounting and undercounting, information on promotions and transfers would offer the best hope for approximating the changes in capital values. Data on the age of each worker promoted and on his wage rates before and after promotion could be used to estimate the change in his present value, indicated by the promotion. If the sum of net changes is to be added to the income earned, the negative changes due to aging should be included. This would prevent doublecounting the replacement value of human capital used up in producing current income. Inquiries about promotions, transfers, wages and ages of employees involved have not yielded sufficient information to calculate any approximations of changes in human capital in the Philippine economy attributable to U.S. base operations.

The Subic Bay schedule of wages for non-U.S. citizen employees contains job titles indicating a variety of skills. The Base Industrial Relations Office issues an impressive catalogue of on-base courses for job related training. Resources devoted to on-base training include a small school of four classrooms, an auditorium, and a staff of two Americans, who are paid a total of $25,000 per year, and ten Filipinos, four of whom are instructors, who are paid a total of $10,000 per year. Assistance from the school staff is available to those who choose to take correspondence courses.[1]

An alternative estimate of the contribution of U.S. bases to Philippine human capital would be the value of inputs devoted to its increase. The training effort at Subic Bay probably accounts for most of this. To the $35,000 for the school staff might be added $5,000 for materials, maintenance, utilities, and other operating expenses. The cost of paid apprentice time in 1966 came to about $80,000.[2] If the cost of the physical facility is $60,000, the annual interest cost of the capital tied up at 4 percent is $2,400. The estimate of the U.S. base contribution to Philippine human capital then would be about $122,400 per year.

REFUSE AND PILFERAGE

The privilege of the Clark Air Base dump and other concessions, including the right to retrieve lost golf balls from the Base course water holes, was granted by General MacArthur to the Negritos tribe. About 1,000 members of this tribe live on the base pursuing the opportunities created by these privileges. Medicine bottles and disposable syringes are recovered and sold to operators in Manila who find them useful for making fraudulent sales of soft drinks represented as penicillin. One line of inquiry pursued in this study was directed at finding out what economic activities might be supported by goods moving

---

[1] There is little training done at Clark Air Base. However, there is some training of Filipino doctors and nurses in Clark's 600 bed hospital.

[2] This information was acquired in the course of a trip to the Philippines by J. H. Hayes, A. A. Barbour, and other Rand researchers in April 1968.

off U.S. bases through pilferage or refuse disposal and entering other
activities as inputs. This trade in fraudulent medicine is the only
example found.

Corrugated iron sheets are widely used in housing construction in
the Philippines. Some of this may come from U.S. base supplies. Table
2 shows values of items stolen on and near Clark Air Base in 1966, 1967,
and the first quarter of 1968. Every category of losses except off-
base personal property rises sharply. Some fraction of the total net
losses in Table 1 should be included in the overall measure of the
benefit of U.S. bases to the Philippine economy. Determination of the
appropriate fraction is difficult. Most stolen items are probably
sold for minor fractions of the values placed on them by their legiti-
mate owners. But some items on which there are import restrictions,
such as American cigarettes, may be worth more than their cost to
legitimate owners.

SPECIAL INDUSTRIES

In the initial phases of the study it was thought that the pre-
sence of U.S. bases might increase business for Manila port and air
terminals. The business generated by U.S. bases could make investments
in facilities worthwhile, which would then attract more sea and air
carriers to schedule stops at Manila, and thus improve Manila's status
as a node in the Southeast Asia transportation routes. This result
would probably have special political appeal in Manila. However,
further study has led to the preliminary judgment that such an effect
from U.S. bases probably does not exist. Most transportation of goods
goes directly to and from military bases inside and outside the coun-
try, and very little passes through the civil facilities at Manila.
Some goods and personnel bound for Clark Air Base do come into Manila
and Subic Bay and are handled on a contract basis. The total volume
of port handling and trucking in this case amounts to about $150,000
per month, most of which is through Manila. This is a small proportion
of the overall transportation volume for the U.S. bases in the Philip-
pines It may be a smaller proportion of the physical than of the
dollar volume, because of monopoly pricing.

Table 2

THEFTS AT CLARK AIR BASE
(U.S. dollars)

	1966			1967			1968 – 1st Quarter		
	Lost/ Stolen	Recovered	Net Loss	Lost/ Stolen	Recovered	Net Loss	Lost/ Stolen	Recovered	Net Loss
Government property (on and off base)	24,697	13,280	11,417	106,971	41,130	65,841	64,944	16,708	48,236
Non-appropriated fund property (on and off base)	12,163	4,947	7,216	47,413	8,589	38,824	22,130	13,488	8,642
Personal property (on base)	30,797	10,497	20,300	61,023	5,084	55,939	24,398	4,720	19,678
Personal property (off base)	158,093	17,402	140,691	118,720	11,814	106,906	34,566	1,084	33,482
TOTALS	225,750	46,126	179,624	334,127	66,617	267,510	146,037[a]	36,000	110,037[a]

Note:

[a] Total differs from sum of items because of rounding.

Source:

Unpublished data acquired by J. H. Hayes during a visit to the Clark Air Base Security Police.

DISTRIBUTION EFFECTS

Any economic activity tends to affect the way wealth and income are divided among the people, as well as the general level of economic welfare. The effect of U.S. bases on distribution of wealth does not affect the quantitative estimate of their contribution to the Philippine economy. However, it could make a substantial difference in the political and social effects of, and attitudes toward, the bases. These differences might affect diplomatic relations and even bear directly on U.S. interests in the country, other than bases. There is a need to know who owns land that has values depending on base activities, who controls the trucking monopoly, who profits in other ways, what roles these people play in shaping popular attitudes and making political decisions.

One well established item of information is that the Huk organization has acquired vested interests in the presence of Clark Air Base. The Huks are said to own several illicit enterprises in Angeles City, just outside Clark's gates, and to collect extortion money from many other (non-Huk) enterprises. There are reported to be about 140 full-time Huks and a large number of part-time supporters who collect about 1,750,000 pesos or $448,700 per year in profits and "taxes" from Angeles City and elsewhere in the provinces of Tarlac, Pampanga, and Laguna. Huk income from U.S. base associated activities may strengthen the insurgent organization, counter to U.S. goals. On the other hand, such opportunities may tend to orient the organization to material gain and away from political and ideological interests.

VIII. CONCLUSION

This Memorandum has traced that part of the Philippine GNP attributable to earnings derived from the presence of U.S. military bases. The result varies with different assumptions about how the Philippine GNP is related to export earnings. Of possible sets of assumptions, one, a regression model, has been advanced as reasonable and feasible to specify with regard to empirical data. The accuracy of reported empirical data is in doubt. Three different sets of Philippine national accounts data provided three different sets of assumptions based on the regression model. Table 3 summarizes the estimates of effects of base-generated spending derived from the data set emphasized in this Memorandum as the official source. Table 4 summarizes an alternate set of estimates for 1966 derived from another data set.

In addition to dollar expenditures on purchases from the local economy made by base agencies, personnel, and visitors, other benefits accrue in the form of skill development and resource transfers through pilferage and refuse disposal. So far as these other benefits could be assessed, their values are negligible.

These estimates of the local economic impacts of U.S. bases are not projections of actual income losses to be expected should base-generated spending cease. In this case, structural adaptations would probably occur and at least partially offset the potential losses implied. Nevertheless, the loss of this source of dollar earnings, unless accompanied by gains elsewhere, might be expected to have a significant effect on the Philippine balance of payments and terms of trade. Major adjustments of economic activities could become necessary to modify these potential effects and minimize the amount of loss.

Table 3

ESTIMATED BENEFITS TO THE PHILIPPINE ECONOMY BASED ON DATA SET I

	1966		1967	
	$ million	₱ million	$ million	₱ million
Base-generated purchases	135.8	529.8	150.0	585.0
Additional production from the GNP multiplier effect	73.9	288.2	81.6	318.0
Additional potential GNP from net new foreign exchange	356.2	1,389.0	393.4	1,535.0
Total impact of base spending	565.9	2,207.0	625.0	2,438.0
Investment in human capital	.1	.5	.1	.5
Pilferage (50 percent of Table 2)	.1	.4	.1	.5
Total benefit	566.1	2,207.9	625.2	2,439.0

($ million)

Dollar receipts	135.8	150.0
Imports from base spending	50.3	55.6
Net new supply of dollars	85.5	94.4

(percent)

GNP and employment from base spending (percent)	3.52	3.55
Total impact as percent of GNP	9.5	9.59

(000 persons)

Employment from base spending	385	400
Full potential employment	1,045	1,080
Number supported	1,155	1,200
Full potential numbers supported	3,135	3,240

Source:
    Derived from Data Set I, found in Table B-1, and calculations presented in Appendix B and in Sections V and VII of this text.

Table 4

ESTIMATED BENEFITS FOR 1966, BASED ON DATA SET II

	$ million	₱ million
Base-generated purchases	135.8	528.6
Additional production from the GNP multiplier effect	135.8	528.6
Additional potential GNP from net new foreign exchange	698.6	2,724.5
Total impact of base spending	970.0[a]	3,783.0[a]
Investment in human capital	.1	.5
Pilferage (50 percent of Table 2)	.1	.4
Total benefit	970.2[a]	3,783.8[a]

	($ million)
Dollar receipts	135.8
Imports from base spending	38.0
New new supply of dollars	97.8

	(percent)
Percent GNP and employment from base spending	3.88
Total impact as percent of GNP	13.86

	(000 persons)
Employment from base spending	427
Full potential employment	1,519
Number supported	1,281
Full potential numbers supported	4,557

Note:

[a]Totals differ from indicated sums because of rounding.

Source:

Derived from Data Set II, found in Table B-?, and calculations cited in Table 3.

Appendix A

THE PHILIPPINE MODEL

GNP MULTIPLIER

The popular impression of the magnitude of the total effect of U.S. military base spending in the Philippines is that it accounts for about 5 percent of Philippine national income and employment.[1] This figure is the same as that in a study prepared by economists at the University of the Philippines.[2]

The Philippine study utilized six categories of spending information for 1966.

I. Local Purchases include spending by military organizations of appropriated and nonappropriated funds for goods and services other than wages. Examples of the organizations involved are military exchanges and clubs as well as unit purchasing offices.

II. Construction includes supplies and materials obtained from the Philippines, and wages paid by contractors to Filipino employees.

III. Wages paid directly to Filipinos by appropriated and non-appropriated fund activities.

IV. Private Expenditures are estimates of the amount spent by members and civilian employees of the Armed Forces for off-base housing, servants, and utilities.

V. Other Private Purchases are estimates of spending by individuals, on or off base, for food, entertainment, and other goods and services directly from the Philippine economy.

VI. Transient Expenditures refer, in the case of the Navy, to men coming off ships on liberty (two million liberties estimated annually), and, in the case of the Air Force, to spending by passengers and crew members whose aircraft are transiting the Philippines.

---

[1]Fortune, December 1967, p. 69.

[2]Economic Research Associates, "Economic Effects of U.S. Government Expenditures on the Philippine Economy," August 1967.

The net spending on Philippine resources was defined to be the
sum of these items less the estimated import component in the resources
sold. For items I through IV the import component was assumed to be
12 percent, the national average ratio of imports to all income produc-
ing sales in the economy. Items V and VI were assumed to contain an
import component of about 30 percent "since these local private pur-
chases other than IV would reflect the import-oriented tastes of most
foreigners." Since items V and VI constituted about 45 percent of the
total spending in 1966, the composite import component is $f = .55(.12)
+ .45(.3) = .201$, or about 20 percent of base-connected spending.

The marginal propensity to save, $s = .18$, is said to be taken
from an estimate by R. W. Hooley.[1] The import propensity is taken to
be $m = .12$ and the tax rate $t = .10$. The "multiplier" is then defined
as $M = b/(s + m + t) = .8/.4 = 2$, where $b = 1 - f$ is the proportion of
base-connected spending that is net of the import component. Thus,
for every dollar spent that can be attributed to the presence of U.S.
military bases the total effect on Philippine national income of the
original expenditure and respending it stimulates is calculated as
equivalent to two dollars or 7.8 pesos.

There are at least three objections to this analysis. First, it
is not usually valid to deduct the import component of the original
expenditure. This proportion is not spent directly on imports but is
the amount it is assumed that the Philippine sellers spend on imports
in order to meet base-generated demands. This proportion therefore
becomes unavailable as income to be derived from the first round of
respending by the sellers who received the original expenditure as
income. But it is meaningless to deduct only the amount spent on im-
ports by these sellers who also pay taxes and save out of their income.

---

[1]Richard W. Hooley, Saving in the Philippines, 1951-1960, Quezon
City, Institute of Economic Development and Research, University of
the Philippines, 1963, p. 54, gives a figure of .22 but says this is
on the high side, without giving an estimate of the magnitude of the
bias. Presumably, the economists at the University of the Philippines
had access to other works or papers of Hooley's.

If it is desired to determine the proportion of the original expenditure that goes into the first round of respending, all these items should be deducted: $1 - .20 - .18 - .10 = .52$. Since the general multiplier effect of spending on the Philippine economy is $1/.4 = 2.5$, $2.5(.52) = 1.3$ is the multiplier of the first round of respending expressed as a proportion of the original expenditure. But this omits the income generated by the original expenditure alone, which is just equal to itself. Therefore the total multiplier of the original expenditure is $1 + 1.3 = 2.3$. The only justification for deducting anything at all from the numerator of the expression for the original multiplier is the alleged difference of the import propensity of the first round of respending from that of subsequent rounds. In this case only the difference, $.20 - .12 = .08$, should be deducted: $M = (1 - .08)/(.12 + .18 + .10) = .92/.4 = 2.3$.

The second objection is to the assumed difference of import component of spending categories V and VI from that of the first four categories or from the national average. It might be expected that the import-oriented tastes of personnel stationed, on liberty, or in transit on U.S. bases would be largely satisfied by PX and commissary purchases rather than by purchases directly from the Philippine economy. If this is the case, there is no reason why the multiplier effect of base connected expenditures should be different from the general multiplier effect -- 2.5 -- of any other exogenous expenditure on the Philippine economy.

The third objection is that no explanation is given for the expression used to define the general multiplier, $M = 1/(s + m + t)$. One might expect that this expression is derived from a set of equations expressing assumptions about relations between some Philippine economic variables, including at least the GNP, savings, imports, taxes, and exogenous expenditures. No such set of equations is shown or referenced in the Philippine study. One simple, plausible set (see Appendix B) yields the expression, $M = 1/(s + m + ct)$, where $c = 1 - s$. This would imply a multiplier for the Philippine economy of over 2.6. (If the second objection is denied, adjustments to satisfy the first and third objections here would result in a multiplier of about 2.4.)

Alternative estimates of the multiplier were derived by ordinary least squares regression based on the reduced form equation developed in Appendix B. The Philippine gross national product was taken to be a function of the sum of exogenous expenditures in the same year, consisting of investment, government and foreign (including U.S. base-connected) expenditures, and of a disturbance variable. This model was fitted to three different sets of data on Philippine national accounts, yielding three different estimates of the Philippine general income multiplier: 2.007, 1.544, and 1.372. The central value of 1.544 is derived from the data set that is probably the most acceptable in the Philippine viewpoint. If this is substituted for the general Philippine GNP multiplier of 2.5 implied in the Philippine study, then the special multiplier for U.S. base expenditures as calculated therein is about .8 · 1.544 = 1.235. Adjusting this for the first objection to that calculation yields .92 · 1.544 = 1.42 if the basic general and import propensities of .12 and .2 remain as assumed therein. (Within the Philippine study definition used for M, this means that $s + t \overset{\sim}{=} .53$ instead of .28 since the M = 1.544 implies $m + s + t \overset{\sim}{=} .65$ instead of .4. Then the first round of respending is 27 percent instead of 52 percent of the original expenditure.)

Maintaining these assumptions about import propensities is, however, not reasonably consistent with changing the estimate of M from 2.5 to 1.544. Maintaining the expression for M and the ratios between m, s, and t that are used in the Philippine study, while setting M = 1.544, implies m = .195, s = .2925, and t = .1625. Maintaining the assumption of special import propensity of foreign-taste-oriented purchases of .3 gives a composite import component of purchases generated by U.S. bases in 1966, f = .55 (.195) + .45(.3) = .2422, exceeding the general import propensity by .04725. This implies a special GNP multiplier for U.S. base expenditures of .95275 · 1.544 = 1.471046.

Maintaining everything in the previous paragraph except the expression for M, using instead M = 1/[m + s + (1-s) t], implies $m \overset{\sim}{=} .212$,

$s \stackrel{\sim}{=} .318$, and $t \stackrel{\sim}{=} .176.$[1] In this case the import component of base-generated purchases is $f = 1 - b = .2516$. The special multiplier is then $(.7484 + .212) 1.544 = 1.483$. If, as indicated by the regression analysis mentioned in the next section, $m = .24$, then $M_s = (.733 + .24)$ $1.544 \stackrel{\sim}{=} 1.5$.

If the assumption of a special import propensity is dropped, in accordance with the second objection to the Philippine study, then the multiplier for assessing the impact of U.S. base-generated expenditures on the Philippine GNP is just 1.544. Thus the third objection to the Philippine study estimate of the Philippine GNP multiplier may result in a reduction of that estimate, although the first two objections would lead to increases. However, if credence were given to the data set in Appendix B, Table B-2, which suggests the GNP multiplier is 2, then it might be said that the three objections taken together leave the estimate arrived at in the Philippine study unchanged. The same result is reached by a quite different route.

THE IMPORT MULTIPLIER

After estimating the GNP multiplier of U.S. base expenditures, the Philippine study continues:

> Finally, we consider the balance of payments effect.
> As stated above, the Philippine propensity to import is
> 12 percent. Since the multiplier equals 2, the equivalent
> of 24 percent of USG expenditures is spent on imports by
> Philippine income recipients. Adding the original 20 per-
> cent import component of the goods and services on which

---

[1]This expression for M involves a minor change in the algebra of the special GNP multiplier, since the saving propensity applies only to disposable rather than total income. The procedure used in discussing the first objection and in the preceding paragraph may be represented as $M_s = (1 - f - s - t)M_g + 1 = (b + m - 1/M_g)M_g + 1 = (b + m)M_g$, where $M_g = 1/(m + s + t)$, the general Philippine GNP multiplier implied in the Philippine study, and M_s is the special multiplier for U.S. base-generated purchases. With the expression $M_g = 1/(m + s + t - st)$, this becomes $M_s = (1 - f - s - t + st)M_g = 1 = (b + m - 1/M_g)M_g + 1 = $ $(b + m)M_g$.

USG expenditures are made, 44 percent must be deducted from the apparent balance of payments effect of USG expenditures. In other words, the net balance of payments effect is 56 percent....[1]

At least four objections can be raised against this procedure and language. The first is similar to the first one raised in the case of the GNP multiplier. If the higher import propensity in the first round of respending is conceded, then this round should be separated from the remainder, each part analyzed separately and the results added back together. According to the Philippine study assumptions, 52 percent of the original U.S. base-generated expenditures is respent on the Philippine economy in the first round of respending. With a general multiplier of 2.5 and import propensity of .12, this first round generates imports in the second and subsequent rounds of respending amount to .52 · .12 · 2.5 = .156 of the original expenditure. This together with the 20 percent out of the first round spent on imports implies that the proper proportion of U.S. base-generated purchases that must be deducted to get the "net balance of payments effect" is .356 or 35.6 percent, rather than 44 percent as concluded in the Philippine study. The general calculating procedure may be represented as

$$D = (1 - f - s - t + st) m \cdot M_g + f = (b + m - 1/M_g) m \cdot M_g + f$$
$$= [(b + m) M_g - 1] m + f = [(.865 + .45 m) M_g - 1] m + .55 m +$$
$$.135 = .45 M_g m^2 + (.865 M_g - .45) m + .135$$

where $f = 1 - b = .55 m + .135$ and D is the proportion of a foreign exchange receipt automatically demanded for imports generated by the receipt. The last term, st, in the parentheses in the first expression would be omitted according to the Philippine study assumptions, but this makes no difference to the subsequent expressions or general calculating procedure. The several alternative assumptions regarding m and M_g considered in the discussion of the third objection to the Philippine study estimate of M give results as follows:

---

[1] Economic Research Associates, "Economic Effects of U.S. Government Expenditures on the Philippine Economy," August 1967.

M_g	m	D
2.5	.12	.3567
1.544	.12	.2512
1.544	.195	.334
1.544	.212	.3539
1.544	.24	.3875

The second objection is the same as that to the GNP multiplier analysis. If there is no special import propensity in the first round of respending then the deducted proportion is just $D = m \cdot M$. The various previously considered values for these give results of $.12 \cdot 2.5 = .3$, $.12 \cdot 1.544 = .185$, $.195 \cdot 1.544 = .301$, $.212 \cdot 1.544 = .327$, or $.24 \cdot 1.544 = .37$.

The third objection is that the concepts of balance of payments effects used in the Philippine study need clarification. Every dollar spent on the Philippine economy by U.S. base agencies or personnel is an additional dollar of foreign exchange resource. The fact that it is also an exogenous expenditure that raises the GNP by M dollars means that the demand for foreign exchange is increased by $\$M \cdot m$ at the current exchange rate. If this new demand is less than the new supply of foreign exchange, then the difference, $1 - M \cdot m$, is a new net supply of foreign exchange which will tend to reduce the peso-dollar exchange rate or allow increases in other exogenous expenditures, such as domestic government or investment expenditures, without creating pressure to raise the peso cost of dollars. The fact that the new net supply of foreign exchange from a dollar receipt is less than a dollar does not mean that the benefit to the economy is less than a dollar.

The balance of payments constraint on new government (or other non-foreign exogenous) deficit spending allowed by $1 of new foreign exchange receipts is that the import demand it generates must not exceed the net new supply of foreign exchange: $G \cdot m \cdot M \leq 1 - m \cdot M \Rightarrow G \leq (1 - m \cdot M)/(m \cdot M)$, where G is new deficit spending. This will generate an increase in the GNP of $G \cdot M$. The total increase in GNP allowed by the foreign exchange receipt is $\$M + \$G* \cdot M = \$M (1 + G*) = \$M [1 + (1 - m \cdot M)/(m \cdot M)] = \$M[1/(m \cdot M)] = \$1/m$, where

G* is maximum new deficit spending within the balance of payments constraint. Given the Philippine study assumption, $m = .12$, the full potential benefit of a dollar earned from U.S. bases is $8.33, which can be added to the GNP without additional adverse pressure on the balance of payments. More generally, the constraint on new deficit spending is $G \leq (1 - D)/(m \cdot M_g)$, where D is defined above.

Perhaps of greater interest to Philippine policymakers is the amount of freedom for new internal deficit spending. The implication of the Philippine study assumptions for this is $(1-.3567)/(.12 \cdot 2.5) = $2.14 per dollar of foreign exchange receipts from U.S. bases. The various alternate assumptions in the discussion above regarding the first two objections to the Philippine study estimate of the "net balance of payments effect" yield nine additional calculations with results ranging from $1.65 to $4.40. These are measures of new latitude that is available for financing policy goals after policymakers take into account the current propensities in the economy to utilize foreign exchange. The "net balance of payments effect" concept, or the net new supply of foreign exchange arising from a new receipt, does not adequately measure the impact or benefit to the local economy from U.S. base-generated purchases.

The best factor for evaluating the overall impact of U.S. base-generated purchases from the Philippine economy is $1/m or $M_s + $(1-D)/m. The implication of the Philippine study assumptions for this is $2.3 + $.6433/.12 = $7.66. The various alternate assumptions above again yield nine additional calculations with results ranging from $4.05 to $8.33.

The fourth objection to the Philippine study procedure for assessing the balance of payments impact of U.S. bases is like the third objection to that study's estimate of the GNP multiplier. No explanation is given for the form of the import multiplier. The general assumptions of the study imply the import multiplier is D, as defined previously, but this is disregarded in calculating the "net balance of payments effect." This is hereafter referred to as D_s, the special import multiplier for earnings from U.S. bases, as

distinguished from the general import multiplier, D_g, which is derived from the definition of D_s by setting $f = m$: $D_g = (1 - 1/M_g) m \cdot M_g + m = m \cdot M_g$. Estimates of the Philippine import multiplier in this form were derived from the regression analysis described in Appendix B. The results obtained from the three data sets were .2812, .3672, and .3998.

These estimates of D_g, together with the corresponding estimates of M_g obtained from the respective data sets, yield indirect estimates of m as follows:

M_g	D_g	m
1.372	.3998	.2914
1.544	.3672	.2378
2.007	.2812	.1401

Taking the rounded value $m = .24$ suggested by the official data, the result of correcting the Philippine study for all the objections raised in this appendix is that the total impact of $1 of export earnings contributes about $4.17 to Philippine GNP. If the Philippine study assumption of a special import propensity associated with U.S. base-generated purchases is maintained, the total impact multiplier of Philippine earnings from U.S. bases in 1966 is $M + (1 - D)/m = 1.5 + .6125/.24 = 4.052$.

Table A-1 summarizes 26 different sets of assumptions and their implications. Line I shows the implications of the Philippine study, corrected only for calculational errors. Line II, like all the lines in which $f = m$, shows the results of dropping the assumption of a special import propensity associated with earnings from U.S. bases. Lines III-VI show the results of each step of modification involved in comparing the Philippine study assumptions with the regression estimates obtained by using the data in Table B-2. Lines VIII-XI and XIII-XVI show the corresponding results with the regression estimates obtained by using the data in Tables B-1 and B-3 respectively. All of these twelve lines maintain the special import propensity assumption about base spending. Lines III, VIII, and XIII also maintain the assumption, $m = .12$. Lines V, IX, and XIV alter this to assume that

Table A-1

SUMMARY OF PHILIPPINE MULTIPLIER ANALYSIS

| Case No. | Assumptions | | | M_s | D_g | D_s | $1-D_s$ (Net New Supply of Foreign Exchange) | $(1-D_s)/D_g$ (Credit Expansion Multiplier) | $M_s+(1-D_s)/m$ (Total Impact Multiplier) |
	M_g	m	f						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
I	2.5	.12	.2	2.3	.3	.3567	.6433	2.14433...	7.660833..
II	2.5	.12	.12	2.5	.3	.3	.7	2.33...	8.333...
III	2	.12	.2	1.84	.24	.30156	.69844	2.910166..	7.66033...
IV	2	.14	.212	1.856	.28	.33184	.66816	$2.3862857(\frac{1}{7})$	$6.62857(\frac{1}{7})$
V	2	.15	.2175	1.865	.3	.34725	.65275	2.175833...	6.2166...
VI	2	.16	.223	1.874	.32	.36284	.63716	1.991125	5.85625
VII	2	--	m	2	$2m$	$2m$	$1-2m$	$(1-2m)/2m$	$1/m$
VIII	1.544	.12	.2	1.42	.185	.2512	.7488	4.04241	7.65978
IX	1.544	.195	.24225	1.471	.301	.334	.666	2.21255	4.88625
X	1.544	.212	.2516	1.483	.327	.3539	.6461	1.97446	4.53073
XI	1.544	.24	.267	1.5	.37	.3875	.6125	1.65347	$4.05226(\frac{1}{3})$
XII	1.544	--	m	1.544	$1.544m$	$1.544m$	$1-1.544m$	$(1-1.544m)/1.544m$	$1/m$
XIII	1.372	.12	.2	1.26	.165	.2323	.7677	4.66288	7.65833...
XIV	1.372	.219	.25545	1.322	.3	.326	.674	2.24328	4.39977
XV	1.372	.24	.267	1.335	.329	.3474	.6526	1.98193	4.054166...
XVI	1.372	.291	.295	1.366	.399	.4017	.5983	1.49859	3.42251
XVII	1.372	--	m	1.372	$1.372m$	$1.372m$	$1-1.372m$	$(1-1.372m)/1.372m$	$1/m$

m increases proportionately with s and t as necessary to equal their sum implied by the respective regression estimates of M_g, while maintaining the structural form of the multiplier assumed in the Philippine study. Lines VI, X, and XV show the results of their changing the structural form to that of the regression model. Lines IV, XI, and XVI show the implications of the regression results themselves. Lines VII, XII, and XVII each summarize the results for any value of m when the Philippine study assumption about the special import propensity is dropped. In particular, by setting m equal to the four values preceding, each of these lines summarizes four calculations of the kind referred to earlier in this appendix.

Two earlier calculations are not summarized. They involve modifying lines I and II by substituting the structural form of the GNP multiplier derived in the regression model for that used in the Philippine study while leaving the structural parameter values unchanged. The values for f, in column 3, depend on the proportion, .45, of U.S. base-generated purchases included in the high import propensity categories in the year 1966. This is not a predicted proportion based on some behavioral hypothesis but an observed quantity that can be used in estimating only past impacts of past base expenditures. At the time of the Philippine study this datum was available for only 1966. Similar data since available for 1967 indicate the proportion for that year to have been about .36. This means that all the lines in Table A-1 where $f \neq m$, to be applicable for 1967, would have to be recalculated, setting $f = .64 \, m + .108$.

Appendix B

THE LINEAR REGRESSION MODEL

It is assumed for this analysis that changes in the GNP are gener-
ated by changes in the class of expenditures on the domestic economy
including those made in foreign exchange, those made by the government,
and those made for the purpose of increasing productive capacity. In
national accounts terminology these are exports and investment and
government expenditures. This class is referred to as exogenous ex-
penditures.[1] It is assumed that the relationship between GNP and exo-
genous expenditures is roughly linear, as described in the following
equation:

$$Y = a_1 + u_1 X + v_1 \tag{1}$$

where Y is GNP, X is exogenous expenditures, a_1 and u_1 are parameters
of the relation and v_1 is a disturbance term.

It is also assumed that imports depend on GNP and therefore on X
in a roughly linear relation, as follows:

$$M = a_2 + u_2 X + v_2 \tag{2}$$

The disturbance terms in equations (1) and (2) are related, as
linear combinations of disturbance terms in an underlying conceptual
model (which may be skipped over by the reader who is uninterested in
examining the details of mathematical models):

---

[1] For further information on the theory of income determination
see M. J. Bailey, National Income and the Price Level, New York,
McGraw-Hill, 1962, esp. pp. 3-11; Daniel Hamberg, Principles of a
Growing Economy, New York, W. W. Norton & Co., Inc., 1961, esp. pp.
172-286, 795; G. L. Bach, Economics, Englewood Cliffs, Prentice-Hall,
1957, esp. pp. 186-211.

$$Y_t = C_t + X_t - M_t \tag{3}$$

$$C_t = \alpha_1 + c(Y_t - T_t) + u_1 \tag{4}$$

$$T_t = \alpha_2 + dY_t + u_2 \tag{5}$$

$$M_t = \alpha_3 + mY_t + u_3 \tag{6}$$

where Y_t = Gross National Product in year t.

X_t = the sum of export earnings, investment and government expenditures in year t. (U.S. base-generated purchases by U.S. personnel and agencies are a part of Philippine export earnings.)

C_t = domestic consumption expenditures in year t.

M_t = expenditures on imports in year t.

T_t = taxes collected by the government in year t.

α_1, α_2, α_3, c, d, and m are parameters.

u_1, u_2, and u_3 are normally distributed random variables with zero expectations, assumed to be independent of X_t. It was also initially assumed that u_j (j=1, 2, 3) in year t was independent of any u_j in any previous year. This was tested by the data and where found doubtful was supplemented with an alternative analysis as explained below.

Solving equations (3) through (6) for Y and M :

$$Y = (\alpha_1 - c\alpha_2 - \alpha_3)/(1-c+m+cd) + X/(1-c+m+cd)$$

$$+ (u_1 - cu_2 - u_3)/(1-c+m+cd)$$

$$M = [m(\alpha_1 - c\alpha_2) + (1-c+cd)\alpha_3]/(1-c+m+cd) + mX/(1-c+m+cd)$$

$$+ [mu_1 - mcu_2 + (1-c+cd)u_3]/(1-c+m+cd)$$

or:

$$Y = a_1 + u_1 X + v_1$$

$$M = a_2 + \mu_2 X + v_2$$

where v_1 and v_2 are normally distributed random variables with zero expectations, being linear combinations of u_1, u_2, and u_3.

Equations (1) and (2) were fitted to three sets of data by the method of ordinary least squares. The three different sets of data are shown in Tables B-1, B-2, and B-3. Table B-1 represents the official estimates from the Philippine point of view. Table B-2 reproduces estimates derived by John Koehler of The Rand Corporation by combining various sources of official and unofficial information. Koehler does not claim any superiority for these estimates. The variation among the three sets of data reflects the uncertainty that exists about what the magnitudes of Philippine economic activities actually are. Primary emphasis is given here to the results based on use of the data in Table B-1. Results of using the other data are shown to give the reader some notion of the range of possibilities.

The least squares fit of equation (1) to the relevant data in Table B-1 results in a Durbin-Watson ratio of about .224. This is too low to accept the hypothesis that the disturbance term, v_1, in any given year is independent of that in previous years. An alternative assumption is that v_1 in any given year is a constant fraction of its value in the previous year, plus a random element:

$$v_{1,t} = \rho v_{1,t-1} + \epsilon \tag{7}$$

ρ is estimated by regressing the residuals for years 2 through n, from the original ordinary least squares fit, on the lagged residuals for years 1 through n-1.[1] That is,

$$\beta = r = [\sum_{t=1}^{n} (\hat{v}_{1,t} \cdot \hat{v}_{1,t-1})] / [\sum_{t=2}^{n} \hat{v}_{1,t-1}^2].$$

---

[1] J. Johnston, _Econometric Methods_, New York, McGraw-Hill, 1960. pp. 196-199.

Table B-1

PHILIPPINE NATIONAL ACCOUNTS DATA (SET I)
(millions of pesos)

Year	Y	M	X
1947	5266	1487	2513
1948	5471	1395	2819
1949	5953	1395	2243
1950	6371	851	2243
1951	7071	1167	2499
1952	7434	1056	2434
1953	7867	1135	2819
1954	8176	1168	2797
1955	8801	1319	2909
1956	9687	1234	3235
1957	10566	1497	3531
1958	11211	1347	3666
1959	12188	1236	4051
1960	13000	1433	4331
1961	14209	2029	5511
1962	15721	3115	6444
1963	18135	2987	8298
1964	19459	3651	9328
1965	21070	3902	10323
1966	23246	4161	11778
1967	25425	5216	12434

Source:
    Office of Statistical Coordination and Standards of the Philippine
National Economic Council.

Table B-2

PHILIPPINE NATIONAL ACCOUNTS DATA (SET II)
(in millions of pesos)

Year	Y	X	M
1956	10,946	3,851	971
1957	12,046	4,497	1174
1958	12,994	4,875	975
1959	14,332	5,160	995
1960	15,618	5,685	1215
1961	16,846	6,455	1657
1962	18,629	7,485	2010
1963	21,188	8,530	2367
1964	23,042	9,152	2554
1965	24,878	9,991	2805
1966	27,289	12,556	2999

Source:
    John Koehler, unpublished manuscript.

Table B-3

PHILIPPINE NATIONAL ACCOUNTS (SET III)
(in millions of pesos)

Year	Y	M	X
1948	6168	1456	2430
1950	6625	908	2000
1951	7367	1198	2194
1952	7519	1123	2163
1953	8002	1255	2441
1954	8170	1287	2495
1955	8687	1475	2643
1956	9406	1378	2911
1957	9991	1641	3109
1958	10684	1453	3154
1959	11369	1373	3350
1960	12126	2670	3683
1961	13432	2766	5387
1962	14972	2914	5988
1963	17145	3088	7419
1964	18701	3781	9038

Source:
    International Monetary Fund, International
Financial Statistics, Supplement to 1965/66
Issues, p. 216.

The other parameters are then re-estimated by fitting the equation:

$$Y_t - rY_{t-1} = a_1(1-r) + \mu_1(X_t - rX_{t-1}) + \epsilon \tag{8}$$

by the method of ordinary least squares.

Using the residuals from the fit of equation (1) to the data in Table B-1, it was found that $r = .799$. The transformed variables are shown in Table B-4. The other parameters, using this model, were estimated as $a_1(1-r) = 1108 \Rightarrow a_1 = 1108/.201 = 5512$ and $\mu_1 = 1.54358$ with a standard error of .10118 giving a t ratio of over 15. The adjusted $R^2 = .92178$ and the F ratio is 232.76 with 1 and 18 degrees of freedom. The Durbin-Watson ratio is 1.629, high enough to assume that there is no second order autocorrelation.

The least squares fit of equation (2) to the relevant data in Table B-1 results in estimates of $a_2 = 180$ and $\mu_2 = .367$ with a standard error of .0187 giving a t ratio of over 19. The adjusted $R^2 = .948786$ and the F ratio is 384.9 with 1 and 19 degrees of freedom. The Durbin-Watson ratio is 1.822, which is sufficiently high to assert that the hypothesis that there is no autocorrelation in the disturbance term v_2 is well within reason.

By this analysis, then, the Philippine income multiplier is indicated to be about 1.54 and the import multiplier .367. If alternatively the model is fitted to the data in Table B-2, the result for equation (1) is $a_1 = 3,707$ and $\mu_1 = 2.007$ with a standard error of .09763 giving a t ratio of over 20. The Durbin-Watson ratio of about 1.4 is high enough to accept the hypothesis that the disturbance term, v_1, in any given year is independent of that in previous years.

The result for equation (2) is $a_2 = 207.3$ and $\mu_2 = .28$ with a standard error of .024 giving a t ratio over 11, adjusted $R^2 = .9282$, F ratio of 137 with 1 and 9 degrees of freedom. The Durbin-Watson ratio of 1.161 is a borderline result of the test for intertemporal independence of disturbance terms $v_{2,t}$. The assumption that the

Table B-4

TRANSFORMED VARIABLES FOR ESTIMATING PARAMETERS OF A STOCHASTIC
RELATION BETWEEN PHILIPPINE GNP AND EXOGENOUS EXPENDITURES
WITH AUTOCORRELATED DISTURBANCES

Year	$Y_t - rY_{t-1}$	$X_t - rX_{t-1}$
1948	$5471 - r \cdot 5266 = 1263.24762$	$2819 - r \cdot 2513 = 811.00879$
1949	$5953 - r \cdot 5471 = 1581.44412$	$2243 - r \cdot 2819 = -9.4979$
1950	$6371 - r \cdot 5953 = 1614.30614$	$2243 - r \cdot 2243 = 450.75$
1951	1980.3068	706.75
1952	1783.9777	437.2
1953	1926.9257	874.1
1954	1889.94	544.5
1955	2268.04	674.1
1956	2654.64	910.6
1957	2825.68	946.1
1958	2768.33	844.6
1959	3229.95	1121.7
1960	3261.28	1094.1
1961	3821.46	2050.4
1962	4367.42	2040.5
1963	5573.27	3148.98
1964	4968.38	2697.6
1965	5521.45	2869.5
1966	6410.2	3529.5
1967	6850.48	3022.9

Source:
    Derived from Table B-1.

disturbance term, v_2, in any given year is independent of those in any previous years can be maintained but is questionable.

Using the autocorrelation model for equation (2) in this case results in a revised estimate of μ_2 = .2643 with a standard error of .03615 giving a t ratio of over 7. The adjusted R^2 = .8484 and the F ratio is 53 with 1 and 8 degrees of freedom. The Durbin-Watson ratio is 1.26. This is high enough to assume that there is no second order autocorrelation. Since these estimates of μ_2 easily lie within the range of each other's standard error, and since the argument presented in the text is better supported the smaller is this estimate, a reasonable and conservative estimate is the one obtained on the assumption of temporal independence among values of the disturbance term, v_2.

A third set of estimates was obtained by fitting equations (1) and (2) to the data in Table B-3. In this case again it was found the autocorrelation adjustment must be used for GNP (r = .6468) but not for imports. The estimates of parameters turn out to be $a_1(1-r)$ = 2015 ~> a_1 = 2015/.3532 = 5705, μ_1 = 1.372 with standard error .121 (t ratio over 11, R^2 = .9045, F = 129; 1 and 12 d.f., Durbin-Watson ratio 1.7), a_2 = 341, μ_2 = .4 with .037 standard error (t ratio 10.8, R^2 = .8881, F = 116.5; 1 and 13 d.f., Durbin-Watson ratio 1.8).

Depending on which set of data might be regarded as most faithfully representing Philippine economic activity in the recent past, different estimates of the current tendency of the Philippine economy to depend on its export earnings, including those from U.S. bases, might be found. Inference about the income and import multipliers that affect this estimate range from 1.37 to 2 and from .28 to .4 respectively. The inferences based on the official data and given primary emphasis in this Memorandum are that the income multiplier is 1.54358 and the import multiplier is .367.